INDIAN DRAGONFLIES.

BY

F. C. Fraser, Lt.-Col., I.M.S., F.R.E.S.

Part XLII.

(*With two plates and three text-figures*).

(*Continued from page* 617 *of volume* xxxvi).

Preface.

The publication of a volume of the 'Fauna of British India' series, dealing with the superfamily *Coenagrioidea* has rendered the continuation of the present papers superfluous, as all species not hitherto dealt with in 'Indian Dragonflies', have been dealt with fully in the volume mentioned above.

Under these circumstances, an opportunity is now given to revise some of the earlier parts of 'Indian Dragonflies', the publication of which gave such a tremendous impetus to the study of Indian *Odonata*.

The monograph was started in the year 1918 at a time when both literature and material were hard to obtain and when the author himself was still on field service at the War. It is partly owing to this and partly owing to the enormous strides made since in the study of the Order that a revision of the earlier parts, dealing with the *Anisoptera,* has become so urgent a matter.

The present paper deals with the genus *Idionyx,* and serves to illustrate how great is the need for revision. Only seven species of this genus were known to science in the year 1921 when Part X of *Indian Dragonflies* was published in this *Journal*, but we now know of twenty. Of the seven species, only four were known to occur within Indian limits, but we can now list fourteen. One species has become obsolete as it has been found to be the opposite sex of an already described species, whilst, on the other hand, the male sex of another species has been found to be nonconspecific and is entirely new. Yet another species thought to belong to genus *Phyllomacromia* and afterwards transferred to genus *Idionyx*, is, in this paper, raised to generic rank under the name of *Idiophya*.

In 1921 we knew absolutely nothing about the ecology of the genus but since then, much of the life-history and habits of various species has been learnt first-hand. Nothing further need be said to stress the argument for revision.

I would like to take this opportunity to thank all those who have contributed to the compilation of the monograph, either by the gift of material or advice from specialists in the Order. More especially are my thanks due to Mr. T. Bainbrigge Fletcher, Imperial Entomologist, who was the first to come forward with offers of material, and who continued to supply me with a mass of species for over a decade. To Mr. Chas. Inglis I am also indebted for material from Darjeeling District and Sikkim, and to Col. F. Wall for large collections from Burma and Ceylon. Major Frere collected for me in the Palni Hills and Mr. H. V. O'Donel opened up a new area in the Duars, Bengal. A large collection was received from Bengal from Mr. H. Stevens, another collection from Assam came from Mr. Chas. Antram, whilst a third and very interesting lot came from Mr. Elton Bott of King Island, Mergui. To all of these collectors I tender my sincere thanks, for it is largely owing to their disinterested efforts that the dragonfly fauna of India is now so well known; the number of species in 1918 totalled only 160, but has now passed the figure of 500.

(Revision of Genus Idionyx).

Genus: Idiophya gen nov.

Medium sized dragonflies belonging to the subfamily *Corduliinae*. Head very large, almost as large as the thorax; eyes globular, broadly contiguous;

occiput very small; frons rounded, deeply grooved; vesicle swollen, rounded at summit, simple in both sexes so far as at present known. Prothorax small, completely concealed by the overhanging head, its posterior lobe simple, thorax comparatively small, metallic, broadly marked with yellow laterally; legs rather long and slim; hind femora extending to a little beyond the end of thorax and furnished with a row of rather widely-set, very tiny spines; tibiae furnished with moderately long fine hair-like spines. Tibial keels absent in the female.

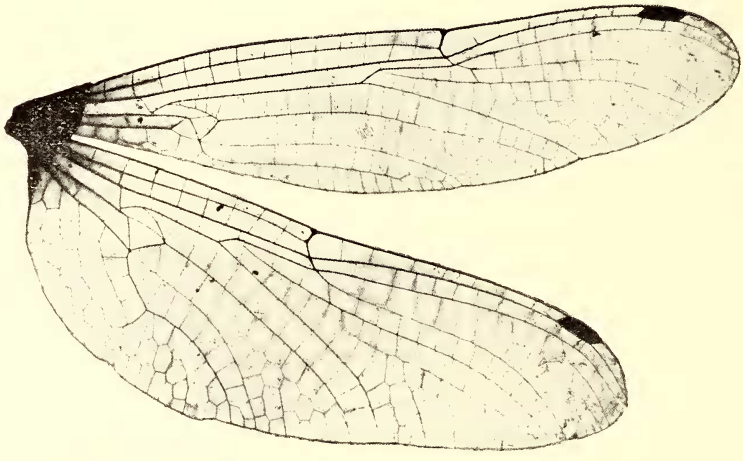


Fig. 1.—Wings of *Idiophya nilgiriensis* (Fras.) ♀.

Wings hyaline, tinted only at extreme base and variably enfumed with dull brown only in adults; reticulation moderately close, nodal index moderately high; hindwing much broader than fore; 1 cubital nervure in forewings, 2 in the hind where the subtrigone does not exist; anal loop sausage-shaped, made up of 9 to 10 cells; hypertrigone of forewing traversed once, that of the hind entire; discoidal triangles entire, *that of forewing four-sided,* the costal and distal sides usually widely separated; that of hindwing with the costal side convex and slightly longer than the basal and distal sides; subtrigone of forewing equilateral, entirely absent in the hind; discoidal field of forewing single-celled to the level of node; *Rspl* well developed in fore- and hind-wings, a single row of cells between it and *IRii; Mspl* absent; pterostigma very short, oblique at both ends, a little swollen at its middle, unbraced; membrane well developed.

Abdomen tumid at base, then cylindrical and constricted and again expanded towards the anal segments, where, in the female, it is markedly depressed; vulvar scale short, triangular, projecting but slightly from the apical end of segment 8; anal appendages of female shortly cylindrical.

Distribution.—Known only from South India and by one species which is riverine and submontane in its habits. This new genus is closely related to *Idionyx* but is more archaic and sharply differentiated by the broken character of the costal side of the discoidal triangle in the forewing, which recalls the more archaic members of the *Libellulinae* such as *Tetrathemis* or similar archaic genera of the *Corduliinae* such as *Pentathemis*, *Neophya* and *Cordulephya*. From the former it is separated by its much simpler venation, the single-celled subtrigone of forewings, only a single cubital nervure present in these wings, by the shorter anal loop and by the discoidal triangle of hindwing entire etc.; from *Neophya* it is separated by the narrower hindwing, this being enormously expanded in *Neophya;* finally from *Cordulephya,* the broader hindwing and the presence of an anal loop will serve to distinguish it, the fore and hindwings of that genus being of the same depth at base. *Idiophya* also differs from species of *Idionyx* by the shape of the abdomen which is expanded and

compressed at the end in the female instead of markedly compressed and of even width as in *Idionyx;* the dorsum of segment 2 marked broadly with yellow is also foreign to *Idionyx*. Probably when the male is discovered we shall find that more characters for differentiation will be added to the above. In habits, *Idiophya* appears to be more retiring and solitary; when ovipositing, it retires deep into the scrub or enters dark caverns and deposits its ova in wet sand or mud. Male and larva unknown.

Genotype.—*Idiophya nilgiriensis* (Fras.).

Idiophya nilgiriensis (Fraser).

Phyllomacromia nilgiriensis Fras. *Journ. Bom. Nat. Hist. Soc.*, Vol. xxv, pp. 383, 384 (1918); Id. ibid., Vol. xxvii, pp. 687, 688 (1921).

Idionyx nilgiriensis Fras. *Rec. Ind. Mus.*, Vol. xxvi, pp. 427, 460, 461 (*saffronata* nec *nilgiriensis*) (1924); Id. ibid., Vol. xxviii, pp. 196, 197, 198 (1926); Id. ibid., Vol. xxxiii, p. 447 (1931).

Female.—Abdomen 30-32 mm. Hindwing 32 mm. (Male unknown).

Head.—Labium dark brown; labrum bright citron or pale yellow bordered narrowly with blackish brown; clypeus glossy black; frons and vesicle dark metallic green; occiput black; eyes emerald green during life, paler above than below.

Prothorax brown; thorax metallic green with a narrow oblique pale yellow stripe on each side on middle of mesepimeron and a similar coloured stripe on the lower border of metepimeron; beneath pale yellow with a transverse stripe across the paired sclerites and a small obscure spot on the unpaired one. Legs yellow, femora black at distal ends, the anterior pair of tibiae also black; coxae yellow, this colour on the middle pair continued up a short distance on to thorax.

Wings hyaline palely tinted with golden yellow at the extreme base, in some specimens this area extends out nearly to the discoidal cells and in others, more adult, the whole of the wings are enfumed pale brown, this brown forming an areola around each cell of the wings, the cell middles being clear; membrane white; pterostigma black, very small, covering only 1 to 1½ cells; anal loop made up of 8 or 10 cells; discoidal cell in forewing four-sided; the costal and distal sides well separated; only a single row of cells between the beginnings of *IA* and *Cuii;* nodal index.—$\frac{6\text{-}12}{7\text{-}8}\,|\,\frac{12\text{-}7}{8\text{-}6}$, $\frac{6\text{-}12}{8\text{-}8}\,|\,\frac{13\text{-}6}{8\text{-}8}$.

Abdomen black; segment 2 with a crown-shaped citron yellow spot on middorsum, the base of the crown turned to the jugal suture and some obscure yellow markings extending outwards and apicalwards to join an incomplete yellow apical ring; segments 1 to 3 broadly yellow along the ventral borders. Vulvar scales small, triangular, not visible in profile. Anal appendages very small, shortly conical.

Distribution.—Known only from the Burliyar river, Nilgiri Hills. I have taken seven specimens in all of this interesting species, all being females and all taken within a small area during the months of June and July.

The type, now in the British Museum, was taken in 1917 and five more specimens were taken at the same spot in 1920 and 1921. I searched in vain for it during June 1931. The disastrous floods of 1923 tore the bottom out of the Burliyar river and swept most of the fauna away; several species once common there, such as *I. burliyarensis*, have totally disappeared. However, last year, 1932, I was fortunate enough to secure a seventh female quite near the old haunts so that the species still exists and the male may yet come to light. This was the only specimen seen although I repeatedly visited the river.

As mentioned above, the habits of *Idiophya nilgiriensis* are rather different from species of *Idionyx* as it keeps to close undergrowth along the banks of the river, threading its way with a very erratic and rather swift flight among the scrub or giant colladiums which grow in patches in marshy spots along the borders of the Burliyar. In flight it is remarkably invisible and a most bewildering insect to follow. The specimen I took in 1932 was seen and lost sight of four times before I took it with what was a blind cut at it with the

net. It deposits its eggs in wet sand or mud, either in dark caverns among the rocks or under shelter of the colladiums which rise from a bed of black slimy mud.

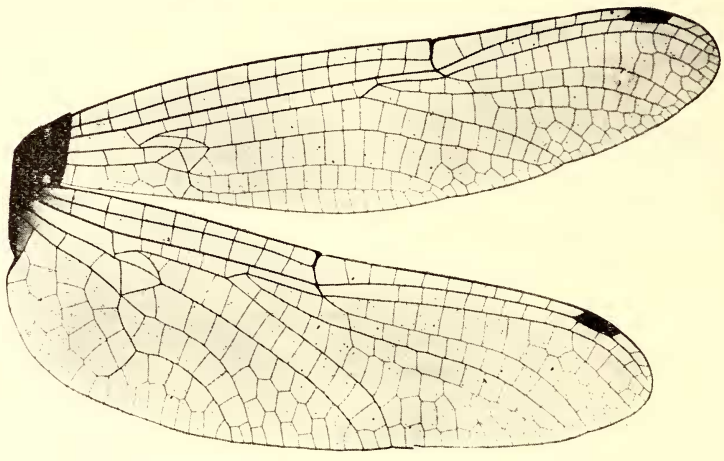


Fig. 2.—Wings of *Idionyx saffronata* Fras. ♂.

Genus: Idionyx Hagen-Selys.

Idionyx Hagen, Zool. Bot. Ges. Wien. xvii, p. 58 (1867); Brauer, ibid., xviii, pp. 370, 742 (1868); Selys, C. R. Soc. Ent. Belg. xiv, p. 6 (1870); Id. Bull. Acad. Belg. (2) xxxi, p. 519 (1871); Id. ibid. xlv, p. 212 (1878); Kirby, Cat. Odon. p. 56 (1890); Karsch, Ent. Nach. xvii, p. 27 (1891); Martin, Cat. Coll. Selys, Cordulines, pp. 57, 80 (1906); Ris, Suppl. Ent. No. 1, p. 79 (1912); Fras. Journ. Bomb. Nat. Hist. Soc. Vol. xxvii, p. 688 (1921); Id. Rec. Ind. Mus. Vol. xxvi, p. 458 (1924); Id. ibid. Vol. xxviii, pp. 195-200 (1926); Id. ibid. Vol. xxxiii, p. 453 (1931).

Dragonflies of medium size belonging to the subfamily *Corduliinae*. Head very large, as large as the thorax; eyes globular, broadly contiguous; occiput very small; frons and vesicle metallic, the latter often of bizarre shape in the female. Prothorax small, posterior lobe simple; thorax small, metallic marked with yellow; legs long and slim, the hind femora extending to a little beyond the posterior end of thorax and armed with numerous closely-set, minute imbricated spines and two rows of fine hair-like spines on all three pairs. Tibial spines numerous, fine, long and closely-set; all tibiae with a membranous keel on the flexor surface, a long keel on the posterior pair but only a short distal one on the middle and anterior pairs of tibiae; tibial claws bifid. Keels absent in the females, otherwise the armature similar.

Wings hyaline, often saffronated at the bases in the females, rarely so in the males; occasionally deeply enfumed in the females, reticulation moderately close; bases shallowly notched in the male, broadly rounded in the female; hindwing much broader than the fore, especially in the female; 1 or 2 cubital nervures in forewings, only 1 in the hind; anal-loop shorter than in the *Libellulinae* and without the toe-like prolongation, of 4 to 7 cells in the male, 8 to 10 in the female; nodal index moderately high; hypertrigones traversed once or twice in the forewings, only once or entire in the hind; discoidal triangles and subtrigones entire; discoidal triangles in forewings equilateral, smaller than the adjacent subtrigone, its base situated far distad the level of the arc; in the hindwings, the distal and costal sides longer than the basal, the base slightly distad the level of the arc; sectors of arc in both fore and hindwings fused for a long distance; discoidal field in forewing made up of a

single row of cells to beyond the level of the node and sometimes almost to border of wings; a single or a double row of cells for about 5 cells in the hindwing; 2 rows of postanal cells in forewings. Pterostigma short, covering $1\frac{1}{2}$ to 3 cells, unbraced.

Abdomen cylindrical in the male, markedly compressed in the female, tumid at base and again somewhat expanded at the anal end; segment 10 in the male with a more or less marked carina or ridge which in some species is produced into a robust spine. Anal appendages of male markedly variable and complex, the superiors occasionally spined beneath, the inferiors usually more or less trifid or with lateral spines. Genitalia of male very homogeneous; lamina depressed, anterior hamules fine stilet-shaped organs, the posterior tumid and bearing a robust strongly curved spine; vulvar scale abbreviated, scoop-shaped, shortly triangular and projecting rather markedly in profile.

Distribution.—The Western Ghats of India, Himalayas, Assam, Burma, Java, Sumatra, Borneo, S. China, Malaysia and the Philippines.

Since I described the four species in Part X of this monograph, a mass of material has been collected and about 150 specimens including 16 species, have been available for this paper. Much also has been learnt of the habits of several species, more especially of those found in the Western Ghats which I have been able to study first-hand. Some species are gregarious and I have seen as many as thirty in one group engaged in a dancing flight like that of a swarm of midges. Both sexes mingle without any attempts at pairing, an action which I have only observed on two occasions in spite of great numbers observed. A male was seen to pounce from nowhere on to a solitary female and the two then flew swiftly down a deep culvert towards the bed of the major stream. *I. burlyarensis* has been seen frequently flying swiftly over the small pools in beds of streams apparently searching for females. Most species are found flying at about ten to thirty feet in the air in forest ridings and glades, others toward dusk descend and fly low over dirty cattle-standings on ghat roads where they probably find an abundance of food. All species breed in torrential mountain streams and none has been observed below an altitude of 2,000 ft.; the larva is distinctly Libelluline in character. The eggs are not laid direct into the parent stream but into seepages along their borders, ova being often laid direct on damp sand. Genotype.—*I. optata* Selys.

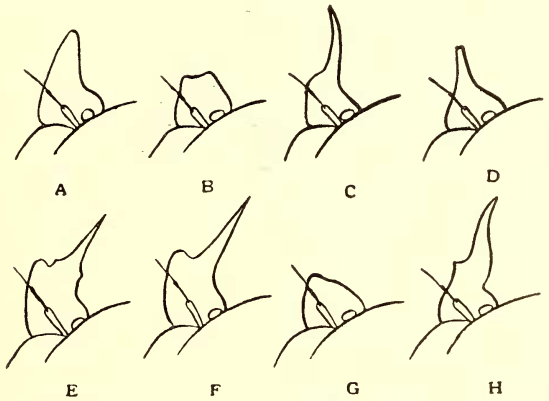


Fig. 3.—Vesicle seen in profile of the females of.—A. *I. burliyarensis* Fras B. *I. optata* Selys. C. *I. unguiculata* Fras. D. *I. intricata* Fras. E. *I. galeata* Fras. F. *I. rhinoceroides* sp. nov. G. *I. travancorensis* Fras. H. *I. corona* Fras.

Key to the males of genus *Idionyx*.

1. { Humeral yellow stripe present on thorax ... ... 2.
   { Humeral yellow stripe absent on thorax ... ... 5.

2. { Segment 10 without a dorsal spine ... *selysi* Fras.
   { Segment 10 with a long erect dorsal spine ... ... 3.

3.	Superior anal appendages with a medio-ventral snipe ... ... 4.	
	Superior anal appendages without such a spine	*intricata* Fras.
4.	Inferior anal appendage with a very small lateral spine surmounting the posterior angle of a quadrate projection ...	*optata* Selys.
	Inferior anal appendage with a very robust simple lateral spine	*stevensi* Fras.
5.	Labrum bright citron yellow narrowly bordered with black ... ... 6.	
	Labrum entirely black	*minima* Fras.
6.	Superior anal appendages with a row of teeth beneath basal half ... ... 7.	
	Superior anal appendages naked beneath ... ... 8.	
7.	Inferior anal appendage trifid, the apical portion very narrowly and deeply emarginate, sloping strongly up at an angle to the basal portion	*galeata* Fras.
	Inferior anal appendage trifid, the apical portion broad and shallowly emarginate, directed straight back in line with the basal portion	*saffronata* Fras.
	Inferior anal appendage trifid, the apical portion very narrowly and deeply emarginate, directed straight back in line with the basal portion	*travancorensis* Fras.
8.	Superior anal appendages simple at apices; inferior variable ... ... 9.	
	Superior anal appendages curled spiralwise at apex and ending in a tuft of hairs	*unguiculata* Fras.
9.	Lateral lobes of inferior anal appendage mere tiny thin erect spines; superior anal appendages shorter than inferior ...	*burliyarensis* Fras.
	Lateral lobes of inferior anal appendage represented by a mere angulation upwards of the lateral border; superior anal appendage shorter than inferior	*corona* Fras.
	Lateral lobes of inferior anal appendage long robust spines; superior anal appendages longer than inferior	*imbricata* Fras.

(The males of *I. rhinoceroides* and *nadganiensis* are unknown.)

Key to the females of genus *Idionyx*.

1.	Vesicle produced and occasionally complex ... ... 2.	
	Vesicle simple, rounded or slightly notched at apex ... ... 6.	
2.	Humeral thoracic stripe present; vesicle surmounted by four tubercles ...	*optata* Selys.
	Humeral thoracic stripe absent ... ... 3.	
3.	Vesicle produced as a simple spine or horn ... ... 4.	
	Vesicle produced as a complex horn ... ... 5.	

4. Vesicle a short blunt horn ... ... *travancorensis* Fras.
Vesicle a short tapering horn with bifid apex ... ... *intricata* Fras.
Vesicle a short cone surmounted by a long fine acutely pointed spine ... ... *unguiculata* Fras.
Vesicle an elongate bluntly pointed curved cone ... ... *burliyarensis* Fras.

5. Vesicle a short cone with a sinuous spine extending back from its apex ... ... *coronata* Fras.
Vesicle a short cone with a long simple straight spine extending back from its apex *rhinoceroides* sp. nov.
Vesicle a short cone surmounted by an obtuse tubercle with a tent-shaped spine extending back from its apex ... ... *selysi* Fras.

6. Humeral thoracic stripe present ... ... 7.
Humeral thoracic stripe absent ... ... 9.

7. Bases of wings broadly tinted with golden amber to the level of distal end of discoidal cells; vesicle conical ... ... *stevensi* Fras.
Bases of wings uncoloured or but slightly so at extreme bases; vesicle blunt, slightly notched ... ... 8.

8. All tibiae bright citron yellow; pterostigma short, covering less than 2 cells; abdomen shorter than wings ... ... *selysi* Fras.
Only the hind tibiae yellow; pterostigma long, covering 2 to 3 cells; abdomen longer than the wings ... ... *nadganiensis* Fras.

9. Labrum entirely black ... ... *minima* Fras.
Labrum bright citron yellow narrowly bordered with black ... ... 10.

10. Bases of wings broadly tinted with golden amber to or beyond the level of distal end of discoidal cells ... ... *saffronata* Fras.
Bases of wings not tinted or only at extreme bases ... ... *imbricata* Fras.

Group I.—*optata*.

Humeral yellow stripe present in both sexes; superior anal appendages of male shorter than the inferior and possessing a ventral spine; female with abdomen markedly compressed and not dilated at the end; vesicle simple or specialized; wings variably tinted with golden yellow at the base.—*optata, yolanda, carinata, intricata, stevensi* and *nadganiensis*.

Group II.—*corona*.

Humeral stripe absent in both sexes; superior anal appendages as long as or longer than the inferior and without a ventral spine; no dorsal spine to segment 10; female with abdomen markedly compressed and not dilated at the end; vesicle specialized; wings not tinted at base or only at the extreme base. —*corona, burliyarensis, unguiculata* and *rhinoceroides*.

Group III.—*dohrni*.

Characters similar to the last group save that the female vesicle is simple and the female of *imbricata* has a vestigial humeral stripe present.—*montana, imbricata, philippa* and *dohrni*.

Group IV.—*saffronata*.

Humeral stripe absent in both sexes; superior anal appendages longer than the inferior and with a row of minute teeth on the ventral surface; female

with vesicle simple except in *galeata* and with the wings usually broadly tinted at the base.—*galeata, saffronata, minima* and *travancorensis.*

Group V.—*claudia.*

Humeral stripe absent in both sexes; superior anal appendages of male of the same length as the inferior, short, simple and Libelluline in character; female with abdomen markedly compressed, not dilated at the end; wings broadly tinted at base; vesicle simple; male with robust spine on dorsum of segment 10.—*claudia.*

Group VI.—*selysi.*

Humeral stripe present in both sexes; female with abdomen markedly compressed and not dilated at the end; wings not tinted at base; vesicle simple; male with a long tapering spine on dorsum of segment 10; superior anal appendages slightly longer than inferior and without a ventral spine.—*selysi.*

Idionyx saffronata Fraser.

Idionyx saffronata Fras. Rec. Ind. Mus. Vol. xxvi, pp. 427, 458-460 (1924); Id. ibid. Vol. xxviii, pp. 196, 197 and 198 (1926); Id. ibid. Vol. xxxiii, pp. 447, 456 (1931).

Male.—Abdomen 33 mm. Hindwing 34 mm.

Head.—Labium brownish yellow bordered diffusely with brown; labrum bright chrome yellow bordered with black; ante- and post-clypeus glossy black; frons dark metallic blue or violet; vesicle dark metallic violet, tumid, nearly as broad as frons, rounded above; occiput black; eyes emerald green.

Prothorax blackish brown. Thorax brilliant metallic green with a narrow medial oblique stripe on each side and the posterior half of the metepimeron yellow. Beneath striped alternately black and yellow, two stripes of each colour.

Legs black, the middle and anterior pairs of femora yellow on the inner sides; tibiae yellow striped with black on the flexor surface.

Wings hyaline, very palely enfumed or saffronated as far out as a little beyond the tornus, more deeply so in the subcostal and cubital spaces and anal triangle; pterostigma black, small, covering 1½ cells; membrane cinereous; anal-loop made up of 7 to 8 cells; nodal index—$\frac{7\text{-}13}{9\text{-}8}\,\Big|\,\frac{13\text{-}8}{8\text{-}9}$.

Abdomen black, the first and second segments marked narrowly along the ventral borders with citron yellow; segments 7 to 10 bordered with bright yellow beneath; segment 10 strongly keeled but without a dorsal spine.

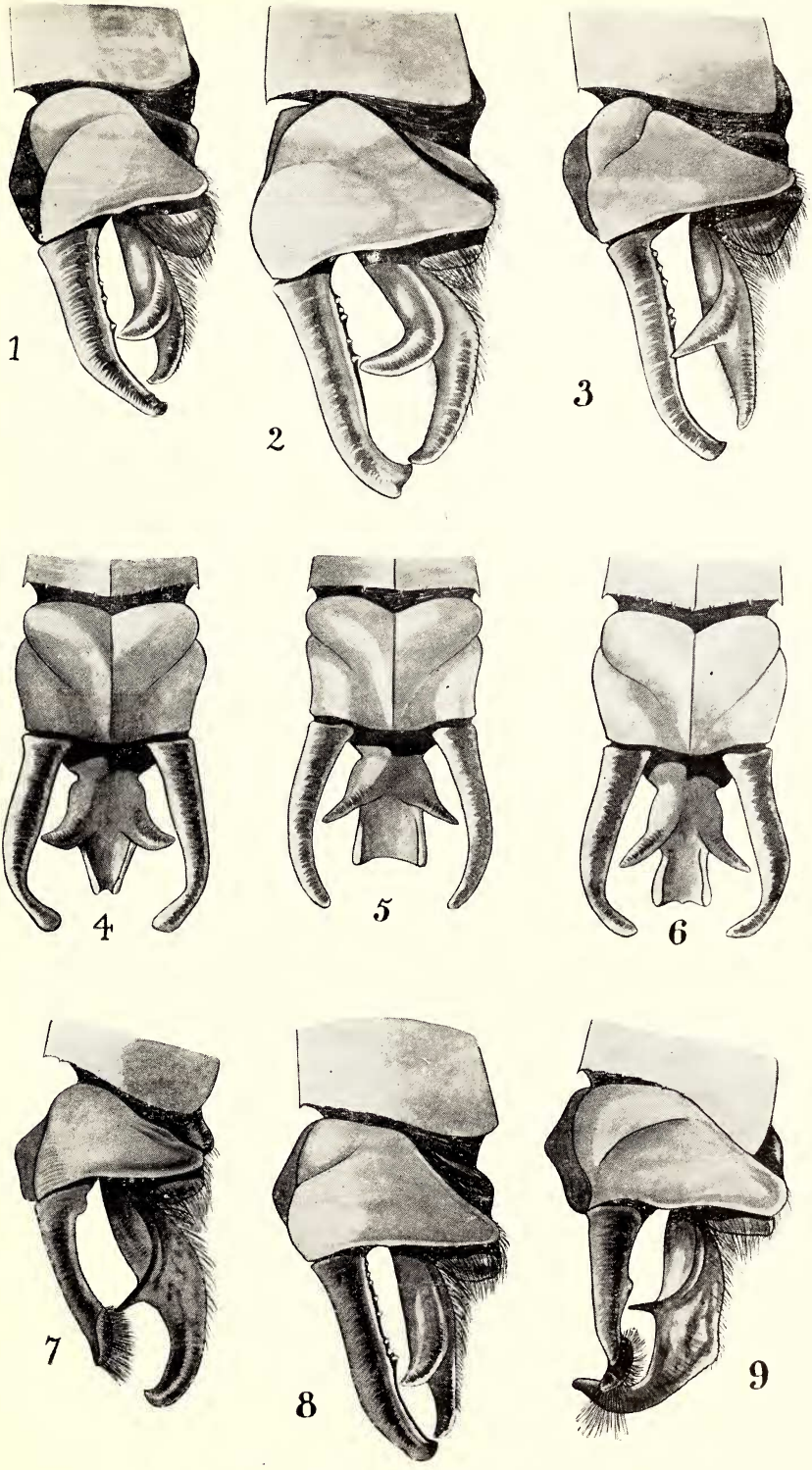
Anal appendages black; superiors tapering from base to apex, flattened on the inner side, apical third angled obtusely inward; an irregular row of minute teeth on the ventral surface near the base of the appendage; inferior directed straight back, the apex not curled up, but deeply trifurcate, the lateral lobes robust, slightly upturned widely divaricate spines, the middle lobe excavate, broad at apex and with a slight prominence at its middle. Genitalia:—lamina broadly and deeply excavate, an emarginate plate projecting from its free border; hamules very tumid, chelate, the outer claw tumid, short, the inner of the same length, prolonged as a long curled spine; lobe rounded, broad, yellow and coated with long yellow hairs.

Female.—Abdomen 34 mm. Hindwing 35 mm.

Closely similar to the male, but differing as follows:—wings hyaline or more or less deeply enfumed especially towards the apices, the bases tinted with deep golden yellow as far out as the level of the outer end of trigones and for the whole breadth of forewings and nearly to the apex of anal-loop in the hind; pterostigma black, small, unbraced, covering 2 cells; nodal index.—

$\frac{7\text{-}13}{9\text{-}8}\,\Big|\,\frac{12\text{-}7}{8\text{-}9}$' $\frac{7\text{-}15}{9\text{-}9}\,\Big|\,\frac{14\text{-}6}{9\text{-}9}$.

Abdomen glossy black, the central lateral borders of segments 1 to 3 and special borders of 1 and 2 moderately broadly citron yellow. Vulvar scale very prominent as viewed from the side, acute and strongly keeled.



ANAL APPENDAGES OF DRAGONFLIES. (For explanation of plate see end of article.)

Distribution.—Coorg at altitudes of about 3,000 ft. and upwards, Annaimallai Hills, S. Malabar and Travancore; common in the first of these localities but far less so in the others. In Coorg, during May and June it was common to see swarms of these insects engaged in what appeared to be a nuptial flight; 30 or more would be seen dancing up and down in the air in a forest clearing or over the forest roads. They fly only during sunlight; even a cloud passing over being sufficient to send them off into the jungle for shelter.

The broadly saffronated wings of the female together with the simple shape of the rounded vesicle will serve to distinguish it from other females except *minima,* which latter however is much smaller and has the labrum entirely black. The male is distinguished by the specific shape of its inferior anal appendage, the middle lobe of which is very broad and directed straight back.

Type male and allotype female have been deposited in the British Museum. May and June are the months to seek this insect.

Idionyx travancorensis Fraser.

Idionyx travancorensis Fras. Rec. Ind. Mus. Vol. xxxiii, pp. 447, 455, 456 (1931).

Male.—Abdomen 32 mm. Hindwing 32 mm.

Head.—Labium blackish brown, paler laterally; labrum citron yellow broadly bordered with black; clypeus and genae black; frons anteriorly and above metallic bluish green; vesicle metallic bluish violet; occiput black; eyes emerald green.

Prothorax blackish brown; thorax metallic green, humeral stripe absent; laterally a narrow oblique stripe at the level of the spiracle and another on the hinder border of metepimeron; beneath black bordered with yellow and with a stripe of paler yellow at its middle. Legs black, tibiae yellow on extensor surface.

Wings hyaline very palely and uniformly tinted with yellow. Pterostigma black, covering 1½ cells, short; membrane cinereous; anal-loop made up of 7 to 8 cells; nodal index.—$\frac{7-12}{8-8}\Big|\frac{12-7}{8-9}$.

Abdomen black, unmarked save for the ventral border of segment 2 and a narrow apical stripe on the same segment yellow; segment 10 strongly carinated but without a dorsal spine.

Anal appendages black; superiors shaped very similarly to those of *I. saffronata* but with the apex angulated more abruptly down. The minute ventral spines present as two groups of 2 or 3 respectively. Inferior appendage differing more widely, its apex tapering to an obtuse emarginate point less than half the breadth of that of *I. saffronata;* the lateral robust spines are much stouter and turned more abruptly outward. Viewed in profile, this appendage however is strikingly like that of *I. saffronata.*

Female.—Abdomen 32-35 mm. Hindwing 34-35 mm.

Resembles the male closely but differs by the colour of the wings and sexual morphology. Vesicle cone-shaped, the cone blunt and differing rather strongly from that of *I. burliyarensis.* The abdomen depressed and fusiform in shape towards the anal segments and somewhat similar to that of the female of *I. nilgiriensis.*

Wings burnt brown throughout, the cell-middles paler giving a stippled appearance to the wing; the bases deeply saffronated or golden yellow as far out as the level of trigones; other details of the wings similar to the male. Vulvar scale similar to that found in *I. saffronata.*

Distribution.—Travancore and the Annaimallai Hills at altitudes of 3,000-4,000 ft. during May and June. The male is easily distinguished by the shape of its inferior anal appendage and the female by its saffronated wings and conical vesicle. Habits similar to those of *I. saffronata* with which I found it in company on the ghat road leading from Munnar, Travancore to Cochin State. Type and allotype female at present in my own collection. Closely related to *I. saffronata, minima* and *galeata.*

Idionyx minima Fraser.

Idionyx minima Fras. Rec. Ind. Mus. Vol. xxxiii, pp. 447, 453-455 (1931).

Male.—Abdomen 27 mm. Hindwing 30 mm.

Head.—Labium, labrum, clypeus and genae black, unmarked; frons anteriorly and above metallic prussian blue; vesicle metallic blue; occiput black; eyes emerald green.

Prothorax blackish brown; thorax metallic green changing on the lower parts of sides to metallic blue; humeral stripe absent but a narrow oblique citron yellow stripe on each side at level of the spiracle and a similar stripe on the posterior border of metepimeron. Beneath brownish black encircled with yellow. Legs black, tibiae striped with yellow on extensor surface.

Wings hyaline, the bases very palely saffronated as far out as 2 cells distad the trigones; pterostigma black, very short, twice as long as broad, only covering 1 to 1½ cells; anal-loop made up of 7 cells; membrane cinereous; nodal index.—$\frac{7\text{-}12}{7\text{-}8}\Big|\frac{13\text{-}6}{9\text{-}6}$.

Abdomen black, unmarked; segment 10 strongly keeled but without a dorsal spine. Anal appendages black; superiors rather longer than segment 10, broad at base, tapering as far as apex, the distal half curved inwards at an obtuse angle and also downward, the apex ending in a short point; a row of minute teeth on the ventral surface of the basal two-thirds as in *I. saffronata*.

Inferior appendage shorter than superiors, deeply trifid and shaped like a bird's claw, the middle lobe very broad and only shallowly emarginate as viewed from above and its apex curled rather strongly up, the lateral spines rather narrow and widely divaricate.

Female.—Abdomen 29-31 mm. Hindwing 30 mm.

Marked similarly to the male. Differs only in sexual characters and in the colouring of the wings which are a deep golden amber as far out as 2 cells beyond the trigones. Vesicle simple, rounded and very slightly notched above.

Distribution.—From Travancore only. I took a few specimens of both sexes flying among tea off the Munnar ghat road during June. It is the smallest species of the genus and is closely related to the two foregoing species and to *I. galeata* by the shape of the anal appendages and especially that of the superiors with the characteristic row of minute teeth beneath near the base. The glossy jet black labrum will serve to distinguish it at once from all of these species, this character applying equally to both sexes.

Idionyx galeata Fraser.

Idionyx galeata Fras. Rec. Ind. Mus. Vol. xxvi, pp. 517, 519 (1924); Id. ibid. Vol. xxviii, pp. 196, 197, 198 (1926); Id. ibid. Vol. xxxiii, p. 447 (1931).

Male.—Abdomen 35 mm. Hindwing 35 mm.

Head.—Labium, labrum and face dark blackish brown; frons in front and above brilliant metallic green; vesicle metallic bluish green or violaceous; occiput black; eyes emerald green.

Prothorax blackish brown; thorax metallic green with a golden reflex laterally; humeral stripe absent; laterally an oblique citron yellow stripe bordering the antero-lateral suture posteriorly and a similar stripe on the lower posterior border of metepimeron. Beneath blackish striped with yellow obscurely, the paired selerites black.

Legs black, anterior and middle coxae yellow; tibiae yellow on extensor surface; the keel on hind tibiae with an interruption in its continuity near the distal end.

Wings hyaline, palely and uniformly tinted with yellow; the neuration sometimes surrounded with an areola of brownish, the cell-middles being clear; pterostigma black, covering only 1½ cells; membrane dark cinereous; anal loop made up of 8 cells; nodal index.—$\frac{8\text{-}14}{9\text{-}9}\Big|\frac{14\text{-}8}{9\text{-}9}$, $\frac{8\text{-}13}{10\text{-}9}\Big|\frac{14\text{-}7}{9\text{-}9}$.

Abdomen black, the borders of segment 2 ventrally yellow as also a fine incomplete annule on the apical border. Anal appendages black; superiors

rather longer than the inferior, subcylindrical and tapering to apex which is a little dilated and turned inwards and a little downwards as viewed from the side; a row of fine teeth along the ventral border especially near the base. Inferior broadly and deeply trifid, shaped like an eagle's talon, the apex narrowly emarginate and turned up very steeply; the lateral lobes large robust spines slanted almost straight upward.

Female.—Abdomen 37 mm. Hindwing 37 mm.

Closely resembles the male save for its sexual characters; differs as follows:—vesicle remarkably specialized, its apex obtuse and with a protuberance behind it shaped like a minaret ending in a fine spine; prothorax a paler brown; thorax without the yellow bordering to the metepimeron; ventral borders of segments 2 and 3 citron yellow; wings hyaline, the bases palely tinted with golden yellow as far out as the third antenodal nervure in the forewing and the second in the hind. Occasionally females are taken with the tinted area extending as far out as the outer end of discoidal triangles in the hindwing and the whole wing more or less deeply enfumed or stippled with warm brown. The female differs from the male and from most other species of the genus by having a double row of cells between the origins of *IA* and *Cuii* in the hindwing.

Distribution.—Coorg and S. Kanara. I took a number of both sexes at Katlikad Estate near Mercara but never found it elsewhere in Coorg. Mr. S. A. Souter found it swarming at about 4,500 ft. on the slopes of Kudremukh, S. Kanara about the middle of June. Most of the specimens were flying quite low over coffee bushes or along the borders of ferny banks. The male is easily distinguished by the shape of its anal appendages and the female by the unique shape of its vesicle.

Idionyx burliyarensis Fraser.

Idionyx corona race *nilgiriensis* Fras. Mem. Dept. Agric. India, Vol. vii, No. 7, pp. 65, 66 (1922).

Idionyx corona burliyarensis Fras. Rec. Ind. Mus. Vol. xxvi, pp. 427, 461, 462 (1924).

Idionyx burliyarensis Fras. Rec. Ind. Mus. Vol. xxviii, pp. 196-198 (1926); Id. ibid. Vol. xxxiii, p. 447 (1931).

Idionyx corona fulvia Fras. Rec. Ind. Mus. Vol. xxvi, pp. 516, 517 (1924).

Male.—Abdomen 35 mm. Hindwing 33 mm.

Head.—Labium bright citron yellow; labrum citron yellow heavily bordered with dark brown; clypeus dark metallic blue; frons broadly rounded, dark metallic green; vesicle dark metallic blue; occiput black; eyes emerald green during life.

Prothorax brown; thorax metallic emerald green with a golden reflex; humeral stripe absent; laterally a moderately broad citron yellow stripe obliquely traversing the spiracle and a similar stripe on the posterior and lower border of metepimeron; beneath yellow, the paired and unpaired sclerites black with a bluish reflex.

Legs black; tibiae paler on extensor surface; the anterior pair with a keel on the outer third, the hinder with a complete keel.

Wings hyaline, untinted save in very adult specimens which may be slightly enfumed; pterostigma black, covering $2\frac{1}{2}$ cells; anal-loop made up of 8 cells; hypertrigones traversed, those of the forewing often twice; usually 2 cubital nervures in forewings, 1 in the hind; membrane palely cinereous; nodal index.—

$$\frac{6\text{–}13}{9\text{–}9} \left| \frac{14\text{–}8}{9\text{–}10} \right.$$

Abdomen black, the ventral borders of segments 1 to 3 yellow as also the intersegmental joint between segments 2 and 3. Anal appendages black; superiors much shorter than the inferior, subcylindrical, rather flattened towards the apex which is bevelled beneath and furnished with a tuft of long coarse golden hairs; inferior very massive, its apex curled strongly up and narrowly emarginate, its lateral spines very small, finely pointed and directed straight up; the appendage deeply hollowed out above in its apical half. Genitalia very similar to that of *I. saffronata*.

(This sex has not been described heretofore.)

Female.—Abdomen 35 mm. Hindwing 35 mm.

Closely similar to the male, differing only in sexual characters and a few minor points. The eyes are emerald green capped with brown; the labrum entirely yellow and there is also a small triangular spot of yellow on the anteclypeus. The wings have amber tinted streaks or rays in the subcostal and cubital spaces and they are more or less enfumed according to age. Anal-loop made up of 8 to 10 cells; nodal index.— $\frac{9\text{-}17}{10\text{-}10}\left|\frac{15\text{-}8}{10\text{-}10}\right.$, $\frac{8\text{-}14}{10\text{-}8}\left|\frac{13\text{-}8}{9\text{-}10}\right.$. The vesicle is specialized and shaped like the horn of a rhinoceros, its apex prolonged, curling back and bluntly acuminate. Abdomen with the ventral borders of segments 1 to 4 yellow, as also the intersegmental joints between 2nd and 3rd and 3rd and 4th segments. Vulvar scale shaped as in *I. saffronata,* prominent and projecting.

The race *fulvia* has the male similar to type but the females have the wings very deeply enfumed; in some this is a warm uniform reddish brown tint throughout but in others it is paler, but the basal marking is a rich maroon extending out fanwise as far as the outer end of discoidal triangles in both wings; the pterostigma is slightly longer and often covering 3 cells.

Distribution.—Coorg, S. Malabar, and rare in the Annaimallai Hills and Travancore. The race *fulvia* is confined to Coorg on the Sampaji Ghat road. *I. burliyarensis* used to be plentiful in the bed of the Burliyar river, Mettupalayam Ghat but has completely disappeared of late years since the disastrous floods of 1923, which tore the bottom out of the river and swept away its fauna. It is quite common in Coorg and the race *fulvia* is plentiful near Sampaji. The males appear on the wing about four in the afternoon and are found flying over the river bed, whilst the females hug the ground around villages or at spots where carts rest for the night; over these dirty cattle-standings an abundance of small flies and midges afford them all the food they need. The dark coloured wings render them almost invisible when flying low over the ground and their dancing erratic aery flight make them most difficult to capture. May and early June are the months in which they should be sought. The male is easily determined by the curious shape of its anal appendages, and the female equally so by its curious shaped vesicle. Type and allotype female in the British Museum.

Idionyx corona Fraser.

Idionyx corona Fras. Journ. Bom. Nat. Hist. Soc., Vol. xxviii, pp. 690, 691 (1921); Id. Mem. Dept. Agric. India, Vol. vii, No. 7, pp. 64, 65, pl. vii, fig. 5 (1922); Id. Rec. Ind. Mus., Vol. xxvi, pp. 427, 462 (1924); Id. ibid. Vol. xxviii, p. 197 (1926).

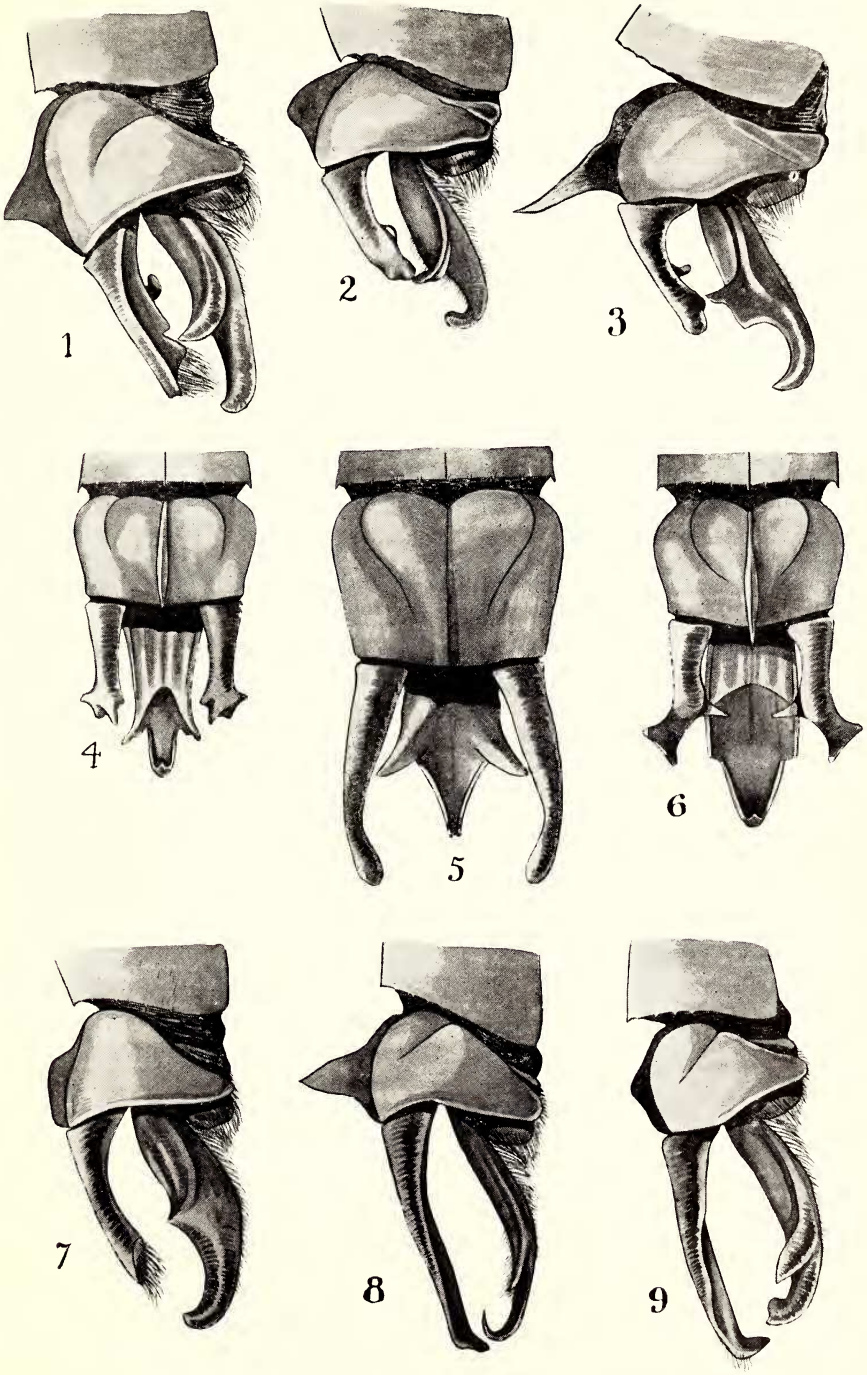
Male.—Abdomen 29 mm. Hindwing 30 mm.

Head.—Labium bright yellow; labrum citron yellow changing to pale brown at the border; anteclypeus with a triangular spot of citron yellow at its centre; postclypeus black; frons and vesicle metallic dark bluish green, the latter conical; occiput black; eyes emerald green.

Prothorax yellowish; thorax metallic green with a golden reflex, with only a vestigial humeral yellow stripe which is entirely concealed by the head; laterally a narrow oblique yellow stripe traversing the spiracle and another along the lower border of metepimeron; beneath yellow, the sclerites dark brownish black. Legs black, tibiae yellow on extensor surface; a short distal keel on anterior tibiae and a complete one on the posterior pair.

Wings hyaline tinted with pale golden yellow at base and diffusely so along the costal border nearly as far as pterostigma; the latter organ black, rather longer than usual, covering 3 cells; membrane pale brown; anal-loop with 8 to 9 cells; 2 cubital nervures in forewings, one in the hind; hypertrigones traversed twice in forewings, only once in the hind; nodal index, $\frac{8\text{-}13}{10\text{-}10}\left|\frac{14\text{-}8}{10\text{-}11}\right.$.

Abdomen black, segments 2 and 3 narrowly yellow along the ventral border; segment 10 prominently keeled. Genitalia closely similar to that of *I. saffronata.* Anal appendages black; superiors much shorter than inferior, subcylindrical, the end bevelled beneath and bearing a few long hairs; seen laterally



Anal appendages of Dragonflies. (For explanation of plate see end of article.)

this appendage is curved gently downwards; inferior very similar to that of *I. burliyarensis* but the lateral spines are entirely missing or merely represented by a lateral angulation of the appendage.

Female. Abdomen 32 mm. Hindwing 38 mm.

Closely similar to the male in colour and markings, the labrum bordered with dark brown and the anteclypeus without the central triangular yellow spot; vesicle markedly specialized, prolonged into an elevated spine shaped like the spout of a tea-pot, this spine springing from the posterior aspect of the apex of the vesicle; wings hyaline but with a dark brown areola surrounding all the neuration, the cell-middles being clear; the base of all wings tinted with golden yellow, this colour extending also along the costa as far as the pterostigma; pterostigma black, covering 2½ cells; membrane white changing to brown posteriorly; anal-loop made up of 11 cells; hypertrigones traversed once in forewings, entire in the hind; nodal index.— $\frac{8\text{-}13}{9\text{-}9}\Big|\frac{12\text{-}7}{9\text{-}9}$.

Abdomen and legs similar to the male; vulvar scale prominent, triangular and projecting.

Distribution.—Only a single pair of this insect is known, the type being a female from the Bababuddin Hills, Mysore, taken June 1915. The male allotype is in my own collection and was taken by Mr. C. A. Souter, I. C. S., at Shiradi, Saklespur Ghat, S. Kanara, 8-5-22. The species is a small one and varies from others by the male, as well as by the female, having the wings tinted with golden yellow along the costa nearly to the pterostigma. The inferior appendage without lateral spines will serve to distinguish it from others of the same group, whilst the female is easily distinguished by the shape of its unique vesicle. Type in the British Museum.

Idionyx rhinoceroides sp. nov.

Female.—Abdomen 32 mm. Hindwing 35 mm. (Male unknown).

Head.—Labium dark brown; labrum yellow diffusely and narrowly bordered with brown; clypeus black; frons and vesicle dark metallic violet or violaceous blue, the latter highly specialized, the base prolonged and blunt at apex from the back of which projects a very long straight tapering spine; occiput black; eyes emerald green.

Prothorax yellowish; thorax emerald metallic green, densely coated with long yellow hairs on dorsum; laterally a narrow oblique citron yellow stripe traversing the spiracle and another bordering the lower part of metepimeron; beneath yellow with oblique bluish black stripes on the paired sclerites and a triangular blackish brown spot on the unpaired. Humeral stripe absent.

Legs black; coxae yellow as also the extensor surfaces of all tibiae.

Wings hyaline but enfumed with warm reddish brown which forms a thick network corresponding to the neuration of the wings, the cell middles being clear; this brown colour deepest at the apices of hindwings; extreme bases tinted with golden yellow; pterostigma short, black, covering 1½ cells only; hypertrigones traversed once in the forewings, entire in the hind; anal-loop made up of 12 to 13 cells; nodal index,— $\frac{7\text{-}11}{8\text{-}9}\Big|\frac{12\text{-}7}{9\text{-}8}$.

Abdomen black, the ventral borders of segments 2 and 3 citron yellow; vulvar scale triangular, projecting as in the last species.

Distribution.—South Malabar; a single female in my own collection collected at Dhoni near Mannarghat in May. Distinguished from all other species by the unique shape of its vesicle. It is evidently closely allied to the last species and probably belongs to the same group.

Idionyx unguiculata Fraser.

Idionyx unguiculata Fras. Rec. Ind. Mus. Vol. xxviii, pp. 20-4205 (1926).

Male.—Abdomen 32 mm. Hindwing 31 mm.

Head.—Labium pale brownish yellow; labrum citron yellow narrowly bordered with black; anteclypeus black with a yellow centre; postclypeus black with a bronzed reflex; frons and vesicle metallic bluish green; occiput black; eyes emerald green during life.

Prothorax brown, the posterior lobe yellowish; thorax metallic green; humeral stripe absent; laterally a narrow oblique citron yellow stripe travers-

ing the spiracle and the lower border of metepimeron the same colour; beneath yellow, paired sclerites brownish black with bluish reflex. Legs black; tibiae paler on extensor surface, their keels similar to those of *I. corona*.

Wings hyaline, only the extreme bases palely tinted with golden yellow; pterostigma black, covering from 1½ to 2 cells; anal-loop made up of 9 to 10 cells; membrane greyish white; nodal index.—$\frac{7\text{-}13}{9\text{-}8}\Big|\frac{14\text{-}7}{8\text{-}8}$.

Abdomen black, the ventral borders of segments 1 to 3 and a fine mid-dorsal stripe extending from segment 1 to the middle of 3 citron yellow; the intersegmental nodes palely yellow from segments 3 to 7, the latter segment with a ventral tuft of yellow hairs as seen in most species; segment 10 strongly keeled, this keel almost amounting to a dorsal spine. Anal appendages black; superiors as long as segments 9 and 10, subcylindrical, tapering slightly towards the apex which has a spiral twist from within downwards and out, the apex of the spiral bearing a tuft of coarse yellow hairs. Inferior appendage considerably longer and of much heavier build, the basal half broad and deep and directed almost straight back on a horizontal plane, the apical portion curled rapidly and strongly up and tapering to a fine point; deeply grooved and hollowed out above and with a small upright spine at its middle on each side perched on the thin lateral borders. Genitalia similar to that of *I. saffronata*.

Female.—Abdomen 31 mm. Hindwing 28 mm.

Very similar to the male, differing in sexual characters and the following points:—vesicle markedly specialized, produced into a long horn somewhat like that seen in *I. corona* but its point recurved forwards instead of backwards and not hollowed out in front; a short vestigial humeral stripe completely obscured by the head; wings with dark golden yellow rays in the subcostal and cubital spaces, the intervening parts more palely tinted as far distal as the 2nd antenodal nervure; in tenerals this tinting is deeper and more extensive outwards. Adults also have the whole of the wing membrane palely enfumed; there are 2 rows of cells between *IA* and *Cuii* in the hindwing at their commencement instead of only 1 row found in the male; anal-loop with 9 to 11 cells; nodal index.— $\frac{8\text{-}12}{9\text{-}8}\Big|\frac{14\text{-}7}{8\text{-}8}$, $\frac{7\text{-}13}{8\text{-}8}\Big|\frac{12\text{-}8}{7\text{-}10}$, $\frac{5\text{-}13}{8\text{-}8}\Big|\frac{12\text{-}6}{7\text{-}9}$. Vulvar scales not differing from the last species.

Distribution.—Maymyo, Upper Burma. A single male and three females collected by Col. F. W. Wall, I.M.S., are now in my collection. The male is easily distinguished by the spiral twist of the apex of the superior appendages and by the tuft of yellow hairs on the same; the female may be distinguished by the shape of its vesicle and also by its vestigial humeral stripe.

Idionyx imbricaita Fraser.

Idionyx imbricata Fras. Rec. Ind. Mus. Vol. xxviii, pp. 197, 198, 205, 206 (1926).

Male.—Abdomen 28 mm. Hindwing 30 mm.

Head.—Labium bright yellow; labrum bright citron yellow narrowly bordered with black; anteclypeus black with a small triangular spot of citron yellow at its middle confluent with the yellow on labrum; postclypeus black; frons and sides of latter metallic bluish green; vesicle blue metallic; occiput black; eyes emerald green.

Prothorax blackish brown, posterior lobe bright yellow. Thorax metallic green or bluish green with a golden reflex; humeral stripe absent; laterally a narrow oblique median citron yellow stripe and the lower posterior half of metepimeron of the same colour; beneath yellow with the paired and unpaired sclerites bluish black. Legs black; the two posterior pairs of tibiae bright yellow, the anterior pair of the same colour on the outer side; tibial keels on anterior pair extending nearly half the length of limb, and for four-fifths the length of tibiae on the posterior pair.

Wings hyaline, bases palely tinted with golden yellow as far distad as the discoidal triangles; anal-loop made up of 9 to 10 cells; pterostigma black, covering only 2 cells; nodal index.— $\frac{6\text{-}12}{9\text{-}8}\Big|\frac{12\text{-}7}{9\text{-}9}$.

Abdomen black; segments 1 and 2 with a broad middorsal bright yellow stripe extending from base to apex; segment 3 with a similar but finer stripe, whilst all three are yellow along the ventral borders, as also are segments 7 to 9 along the lower border. Segment 10 with a blunt middorsal keel not amounting to a spine.

Anal appendages black; superiors longer than inferior, subcylindrical, directed straight back but the extreme apex abruptly turned downwards and slightly inwards; the appendage twisted on itself so that the external surface ultimately comes to look upwards and inwards; inferior appendage more massive, deeply trifid, the apical median portion curled strongly upwards, pointed at the end and tumid immediately before this point above; the outer lobes robust spines, directed slightly upwards, backwards and outwards.

Female.—Abdomen 31 mm. Hindwing 33 mm.

Very similar to the male save for sexual characters; the postclypeus yellowish; vesicle simple, rounded as in the male; a vestigial humeral stripe present but which is entirely concealed by the overhanging head; legs blackish brown.

Wings hyaline, brightly tinted with golden-yellow at the extreme base; anal-loop with 10 cells; 2 cubital nervures in the hindwing; all hypertrigones traversed once; pterostigma small, covering 2 to 2½ cells; only a single row of cells between the commencements of *IA* and *Cuii* in the hindwing as in the male; nodal index.— $\frac{8\text{-}13}{10\text{-}9}\,\big|\,\frac{13\text{-}8}{9\text{-}10}$.

Abdomen black; segments 2 and 3 with the middorsal ridge narrowly yellow as also the joint between the two segments; ventral borders of segments 2, 3, 7 and 8 yellow. Vulvar scale not differing markedly from others of the genus but rather shorter and obtuse at apex.

Distribution.—Reported only from Shillong, Assam from June to August at an altitude of 6,000 ft. Type in the British Museum, allotype female in the Morton collection. (In the original description it was stated that the female was unknown although this sex was actually described; the mistake arose from the latter description being added later during correction of the proofs and without deleting the former note.) This species is closely related to *I. dohrni* by the shape of its appendages etc. The female may be determined from others by the vestigial humeral stripe combined with a simple vesicle, and from *I. dohrni,* from Borneo, by the wings less tinted with yellow; the male is easily distinguished from all other Indian species by its long attenuated appendages, much longer than the inferior, whilst it differs from *I. dohrni* by the shape of the inferior appendage, more robust, the apex not ending in a fine prolonged spine and the lateral spines much longer and more robust, these being almost vestigial in the latter species.

Idionyx optata Selys.

Idionyx optata Selys, 2nd Additions Syn. Cordulines, Bull. Acad. Belg. (2) xlv, p. 196 (1878); Id. Ann. Mus. Civ. Genov. xxx (x), p. 472 (1891); Mart. Cat. Coll. Selys. (Cordulines) p. 80 (1906); Ris. Suppl. Ent. No. 1, pp. 82, 83 (*carinata* nec *optata*) (1912); Fras. Rec. Ind. Mus. Vol. xxxiii, pp. 196, 198, 200, 201 (1926).

Idionyx ornata Fras. (the female of *optata*) Mem. Dept. Agric. India. Vol. vii, No. 7, pp. 66, 67 (1922); Id. Journ. Bom. Nat. Hist. Soc. Vol. xxvii, pp. 688, 689 (1921).

Male.—Abdomen 33-34 mm. Hindwing 33 mm.

Head.—Labium bright ochreous; labrum bright yellow bordered with dark brown; clypeus and front of frons as well as its sides and genae bright yellow; frons above metallic bluish green; vesicle metallic bluish green marked in front with ochreous; occiput black; eyes emerald green during life.

Prothorax dark ochreous; thorax metallic emerald green on dorsum, dark metallic blue on the sides, marked with short bright clear cut humeral stripes of citron yellow extending halfway up the dorsum and laterally, by similarly coloured oblique stripes on the mesepimeron and lower part of metepimeron; beneath yellow, the sclerites dark brown with a bluish reflex. Legs dark reddish brown, tibiae bright ochreous; tibial keels complete on the hinder

tibiae save at the extreme proximal end, and extending for rather less than the distal half of the anterior pair.

Wings hyaline; pterostigma black, covering to 1½ to 2 cells; anal-loop made up of 9 to 10 cells; hypertrigones all traversed once; 1 cubital nervure in forewings, 1 or 2 in the hind; nodal index.— $\frac{7\text{–}14}{9\text{–}9}\Big|\frac{12\text{–}8}{9\text{–}9}$, $\frac{7\text{–}12}{8\text{–}7}\Big|\frac{21\text{–}6}{7\text{–}8}$; membrane brown.

Abdomen black; segments 2 and 3 with the ventral borders yellow, segment 2 with a broad middorsal citron yellow stripe extending its whole length and continued onto segment 3 as a fine middorsal line; the joint between these two segments also yellow. Segment 10 with a very long attenuated middorsal spine directed or sloping somewhat posteriorwards; no ventral tuft of hairs, present as in most other species. Genitalia not differing markedly from that of *I. saffronata*.

Female.—Abdomen 30 mm. Hindwing 30 mm.

Differing in but few respects from the male. The vesicle specialized, a broad short cone, its summit flattened and bearing a transverse sulcus in two directions which cuts it into four small tubercles, yellow the top metallic dark green. Wings deeply tinted with golden yellow at bases as far out as the 2nd or 3rd antenodal nervures and discoidal triangles; anal-loop made up of 12 cells; nodal index.— $\frac{8\text{–}12}{10\text{–}8}\Big|\frac{13\text{–}7}{9\text{–}10}$; other details of venation similar to the male; abdomen black marked as in the male; vulvar scale not as prominent as in other species, rounded at margin.

Distribution.—Assam. The type is from Cherrapunji and is now in the Selysian collection. Paratypes of both sexes in the British Museum and my own collections.

The male is distinguished at once by the curious shape of its appendages as also by the face entirely yellow, thus differing strikingly from other species. From *I. carinata* Ris., from S. China, to which this species is closely related, the smaller ventral spine on the superior anal appendages and the long fine spine on the sides of the inferior appendage will serve to distinguish it. The female is distinguished from all other species by the flat topped vesicle bearing four small tubercles; in *carinata* the vesicle bears three tubercles, the middle one the longest.

Idionyx intricata Fraser.

Idionyx intricata Fras. Rec. Ind. Mus. Vol. xxviii, pp. 197, 198, 202, 203 (1926).

Male.—Abdomen 28 mm. Hindwing 30 mm.

Head.—Labium yellow; labrum dark ochreous, its borders bronzed brown, clypeus black, the anteclypeus with a small triangular medial yellow spot; frons dark metallic green; vesicle dark metallic bluish green; occiput black; eyes emerald green.

Prothorax blackish brown, yellowish laterally; thorax dark metallic green with a short vestigial humeral citron yellow stripe; laterally an oblique citron yellow stripe on the mesepimeron and another on the lower part of the metepimeron; beneath yellowish, the sclerites blackish brown. Legs blackish brown; tibiae yellow changing to reddish brown at proximal ends; tibial keels closely similar to those of the last species.

Wings hyaline; pterostigma black, covering 2 cells; membrane white at base, brownish posteriorly; anal-loop made up of 8 cells only; hypertrigones of forewings traversed twice, but once only in the hind; nodal index.– $\frac{6\text{–}13}{10\text{–}10}\Big|\frac{13\text{–}7}{10\text{–}10}$.

Abdomen black; segments 2 and 3 with the ventral borders broadly yellow; segment 2 has also a narrow bilobate middorsal yellow stripe; segment 10 with a prominent triangular middorsal spine but not tapered to a point as in *I. optata*. Genitalia not differing markedly from others of the genus.

Anal appendages black; superiors short and thick, compressed, broad at base and again at apex where the appendage expands into a flattened organ, shaped like a hand shorn of its fingers, save the stumps, of which four may be noted:—a robust spine at the inner angle sloping inwards and down-

wards, a second adjacent to the last, directed straight back and followed by a third which is a mere kunckle, lastly a fourth at the outer angle, a long robust spine directed straight outwards. The inferior appendage much longer and closely resembling that of *I. optata* but the lateral spines with a greater spread and larger, their inner margins crenulate, whilst the apex is curved strongly and steeply upwards.

Female.—Abdomen 31 mm. Hindwing 35 mm.

Closely similar to the male save for sexual characters and a few other points. Vesicle highly specialized, shaped like the dome of a pagoda, its tapering apex split into two minute points. Wings evenly, diffusely and deeply enfumed especially towards the apices, the bases tinted with golden-yellow as far as the distal ends of discoidal triangles; anal-loop of 10-11 cells; 2 rows of cells between the beginnings of *IA* and *Cuii* in the hindwings; pterostigma covering 2½ to 3 cells, black, longer than in the male; nodal index.— $\frac{8\text{-}14}{10\text{-}10}\Big|\frac{14\text{-}8}{9\text{-}11}$.

Abdomen similar to the male but markedly compressed as in the rest of the females of the genus; vulvar scales prominent, projecting in a beak-like manner.

Distribution.—Cherrapunji, Assam. A single pair in my own collection. The male is easily distinguished by the shape of its anal appendages which bear some close resemblance however to *I. optata*. From the latter, the short stouter middorsal spine on segment 10 will at once serve to distinguish it; it is also a much smaller insect. The female is quite easily identified by the unique shape of its vesicle. (In the original description, the two sexes were described apart but subsequently included under one name—thus 'Female unknown', and 'Male unknown', should have been erased but were overlooked when correcting the final proofs.)

Idionyx stevensi Fraser.

Idionyx stevensi Fras. Rec. Ind. Mus. Vol. xxvi, pp. 462, 463 (1924); Id. ibid. Vol. xxviii, pp. 196-198 (1926).

Male.—Abdomen 32 mm. Hindwing 33 mm.

Head.—Labium and labrum bright ochreous; clypeus black; frons and vesicle dark metallic blue; eyes emerald green; occiput black.

Prothorax brownish; thorax metallic bluish green or green, with a short bright citron yellow humeral stripe deficient on the upper half of dorsum, and the usual oblique lateral stripes, one on the mesepimeron, the other on the lower part and border of metepimeron; beneath yellow with a dark oblique metallic green stripe on each of the paired sclerites and a large spot on the unpaired.

Legs blackish brown; the two hinder pairs of tibiae yellow on outer surface, the anterior pair pale brown.

Wings hyaline, the extreme bases only tinted with golden yellow; membrane ashy white; pterostigma black, covering 1½ cells; anal-loop made up of 8 cells; nodal index.— $\frac{7\text{-}13}{11\text{-}9}\Big|\frac{13\text{-}7}{9\text{-}11}$.

Abdomen black; segments 2 and 3 yellow along the ventral border; intersegmental joints from 1 to 4 also yellow. Anal appendages black; superiors broad at base, tapering somewhat towards apex which is squared at the end, hollowed out below and presenting on the inner border a short curled digitate obtuse spine and a deep incision just distad of this; the apex bearing a tuft of coarse golden hair. Inferior directed horizontally back, broadly trifid, the apex not upturned save its extreme point; the lateral lobes robust, divaricate, upturned spines. Genitalia very similar to that of *I. saffronata*. Segment 10 of abdomen bearing a prominent triangular spine on its middorsum but not long and tapering as in *I. optata*.

Female.—Abdomen 33 mm. Hindwing 34 mm.

Closely similar to the male, differing only in sexual characters and a few minor points; vesicle simple, rounded as in the male; wings very broadly tinted with golden amber at the bases as far out as the distal ends of

discoidal triangles; membrane pure white; pterostigma longer and narrower, covering 2 to 2½ cells; anal-loop made up of 9 to 10 cells; nodal index.—

$$\frac{7\text{–}13}{10\text{–}9}\Big|\frac{12\text{–}8}{9\text{–}10}, \quad \frac{8\text{–}12}{9\text{–}7}\Big|\frac{13\text{–}8}{7\text{–}9}.$$

Abdomen compressed markedly as in other species, black, marked as in the male. Vulvar scale similar to that of *I. saffronata*.

Distribution.—North Bengal, especially common in the Darjeeling district. I found it quite common at Mangpu during May; its habits, especially those of the female, were quite similar to those of *I. saffronata* which the female greatly resembles when in the air. The male is easily distinguished by the shape of its superior anal appendages, whilst the female with its broadly tinted wings, simple vesicle and short humeral stripe possesses a complex shared by no other species.

Idionyx nadganiensis Fraser.

Idionyx nadganiensis Fras. Rec. Ind. Mus. Vol. xxvi, pp. 427, 460 (1924); Id. ibid. Vol. xxviii, pp. 197, 198 (1926); Id. ibid. Vol. xxxiii, p. 447 (1931).

Female.—Abdomen 35 mm. Hindwing 35 mm. (Male unknown.)

Head.—Labium bright chrome yellow narrowly bordered with brown; labrum bright citron yellow narrowly bordered with black; clypeus black; frons and vesicle dark metallic blue; occiput black; eyes emerald green during life. Vesicle rounded, simple.

Prothorax brown; thorax brilliant metallic green marked with bright citron yellow.—a narrow clear-cut humeral dorsal stripe on the lower half of thorax, a narrow oblique stripe on the middle of mesepimeron and another on the lower half of metepimeron. Beneath yellow with an oblique stripe of black on the paired sclerites and a transverse one on the unpaired one.

Legs black; tibiae bright yellow on outer surfaces except the anterior pair.

Wings hyaline, very palely enfumed, the extreme bases only tinted with golden-yellow to as far as the cubital nervure or distal end of cubital space; pterostigma black, covering 2½ cells; anal-loop made up of 9 cells; membrane cinereous; nodal index.— $\frac{8\text{–}14}{9\text{–}9}\Big|\frac{14\text{–}7}{9\text{–}9}$.

Abdomen black, markedly compressed; segments 1 and 2 with the ventral borders yellow and the intersegmental joints between these and segments 3 and 4 narrowly yellow. Vulvar scales hardly visible in profile, extending beyond the apical border of segment 8.

Distribution.—At the top of the Nadgani Ghat, Nilgiri Wynaad, during August. Only two females are known of this rare insect, the type in the British Museum, and one other in my own collection. The specimens I have quoted in the Rec. Ind. Mus., from Coorg and Kanara are doubtfully identified and have the humeral stripe very poorly developed as compared to the type of *I. nadganiensis*.

It is to be distinguished from other species by the simple vesicle coupled with a well-developed humeral stripe. Except for the very restricted tinting of wings at the bases, this species closely resembles the female of *I. stevensi* from Bengal.

Idionyx selysi Fraser.

Idionyx selysi Fras. Rec. Ind. Mus. Vol. xxviii, pp. 197, 198, 201, 202 (1926).
Idionyx yolanda Selys, (Male) 2nd Add. Cordulines, Bull. Acad. Belg. (2) xlv (1878); Fras. Journ. Bom. Nat. Hist. Soc. Vol. xxvii, pp. 689, 690 (1921).

Male.—Abdomen 31 mm. Hindwing 30 mm.

Head.—Labium bright chrome yellow; labrum bright citron yellow narrowly bordered with black; clypeus steely black; frons and vesicle dark metallic blue; occiput black; eyes emerald green during life.

Prothorax brownish; thorax metallic green marked with bright citron yellow: a short humeral stripe extending up the lower third or slightly more of dorsum of thorax, an oblique rather broad stripe on the middle of mesepimeron and an equally broad stripe on the lower part of metepimeron; beneath yellow, the paired sclerites broadly bordered with bluish metallic stripes outwardly. Legs black, all tibiae bright citron yellow.

Wings hyaline, only a faint tint of yellow at the base of the hindwings; pterostigma black, covering less than 2 cells, short; anal-loop made up of 8 to 9 cells; occasionally 2 cubital nervures in the hindwing; nodal index.— $\frac{6\text{-}12}{8\text{-}8}\left|\frac{12\text{-}6}{9\text{-}7}\right.$.

Abdomen black, segments 1 to 3 broadly bright yellow along the ventral borders, and with a fine stripe along the middorsal carina which broadens considerably on segment 2. Segment 10 with a robust middorsal carinal spine which rises steeply up and is variably yellow in part or whole.

Anal appendages black; superiors very long, nearly as long as the last three segments of abdomen, narrow, slightly sinuous and slightly tapered, the extreme apex abruptly turned down at a right angle and pointed; inferior of the same length, very narrow and long as compared to other species except *I. dohrni* and *montana,* the extreme apex tapered to a needle-like point and curled strongly up and over; the usual lateral spines situated very near the apex and very small and inconpsicuous in character. Genitalia very similar to other species of the genus.

Female.—Abdomen 27 mm. Hindwing 30 mm.

Closely resembles the male save for sexual characters; the yellow markings more conspicuous and extensive, the humeral stripe tapering to a point above and nearly extending to antealar sinus; the lateral stripes broader and the underside without its bordering black or with a mere line of this colour. Abdomen with the yellow middorsal stripe on segment 2 very broad especially near the base; this segment remarkably expanded on the dorsum immediately apicad to the jugal suture (There is a suggestion of this in other species but not to the extent seen in *selysi*); segments 7 and 8 with the middorsal carina bright yellow. Vesicle quite simple as in *I. stevensi* or *nadganiensis*, rounded.

Wings only slightly tinted at the base, but little more so than in the male; pterostigma not much longer than in the male; anal-loop with 9 cells; only a single row of cells between the origins of *IA* and *Cuii* in the hindwings; nodal index.— $\frac{6\text{-}13}{8\text{-}9}\left|\frac{13\text{-}6,}{8\text{-}7}\right.$ $\frac{6\text{-}15}{8\text{-}10}\left|\frac{14\text{-}6}{10\text{-}8}\right.$. Vulvar scale similar to that of *I. saffronata.*

Distribution.—The male, described as the male of *I. yolanda* by Selys, from the Karen Hills, Upper Burma, is now in the Selysian collection. One pair, the type and allotype, in the British Museum, and one male and two females in my own collection, are all from Maymyo, Upper Burma, collected by Col. F. Wall in June and July. This species is remarkable for the broad extent of its yellow markings especially the humeral stripe in the female and the abdominal markings. The male is easily distinguished at a glance by the long yellow dorsal spine on segment 10 as well as by the shape of the anal appendages. (These latter are very similar to those of *dohrni* and *montana* but neither of these have the dorsal spine on segment 10.) The female is distinguished by the long clearly defined humeral stripe and dorsal markings on segments 7 and 8.

Explanation of Plate I.

Anal appendages of the males of.—

1. *I. minima* Fras., lateral view.
2. *I. galeata* Fras., lateral view.
3. *I. travancorensis* Fras., lateral view.
4. The same dorsal view.
5. *I. minima* Fras., dorsal view.

6. *I. saffronata* Fras., dorsal view.
7. *I. burliyarensis* Fras., lateral view.
8. *I. saffronata* Fras., lateral view.
9. *I. unguiculata* Fras., lateral view.

(Camera lucida studies drawn to the same scale.)

Explanation of Plate II.

Anal appendages of the males of.—

1. *I. stevensi* Fras., lateral view.
2. *I. intricata* Fras., lateral view.
3. *I. optata* Selys, lateral view.
4. *I. intricata* Fras., dorsal view.
5. *I. galeata* Fras., dorsal view.
6. *I. optata* Selys, dorsal view.
7. *I. imbricata* Fras., lateral view.
8. *I. corona* Fras., lateral view.
9. *I. selysi* Fras., lateral view.

(Camera lucida studies drawn to the same scale.)